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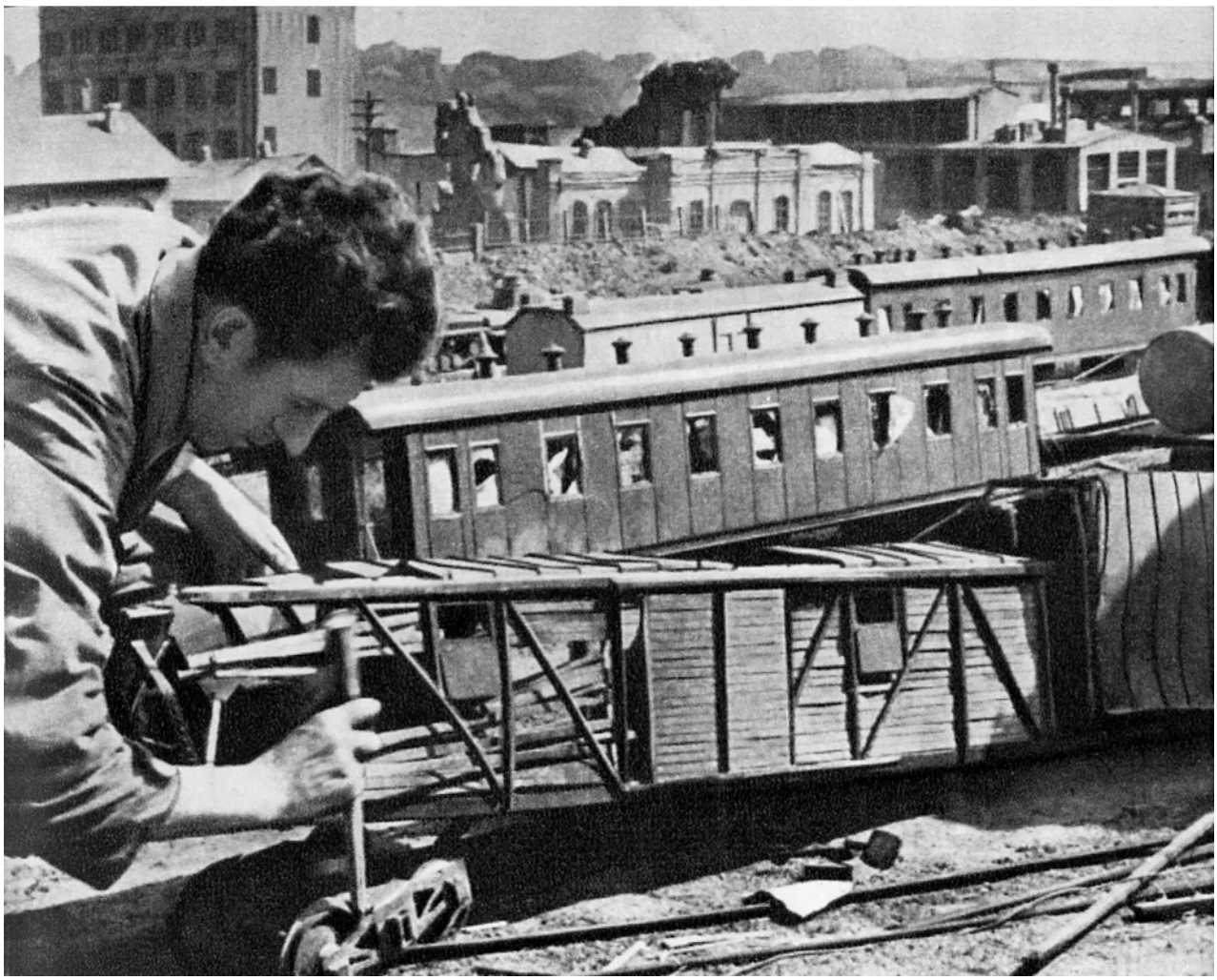
7. Какой киноприём позволяет скрыть, что перед нами игрушечный лунный ровер?

11-14 minutes

In the previous article "The most famous" lunar "shots were shot using dolls" it was about the fact that the passage of the rover on the moon in the Apollo 16 mission was filmed using a model - a reduced copy at a scale of 1: 8.

With the help of models in the pre-computer era, a lot of scenes were filmed that are very difficult or impossible to perform on location or in the scenery. These episodes include all kinds of battle scenes with fires, explosions, and destruction. If the script of the film provided for episodes with the fall of planes or trains, then their reduced copies were made by the model workshop of the film studio.



A pyrotechnician sets up pyrotechnic charges on a model of a destroyed railway station. The buildings in the background are also mockups.

With the help of models, natural disasters, such as volcanic eruptions, earthquakes, floods, were filmed, and still continue to be filmed. Mockups are often used when shooting nautical scenes, especially when sailing ships

are shown that do not exist at the present time. The air battle was filmed only on mock-ups.

So that the viewer did not have time to guess that the model was in the frame, they tried to show it as little time as possible, only at the most necessary moment, and even then the object was immediately hidden in clouds, splashing waves or in a stream of fire and smoke.

The model of the starship is hiding in the clouds. Still from the film "When the Worlds Collide", USA, 1951

Spaceship landing on another planet. As a starship - a mock-up. Scattering snow is made of flour. The mountains are drawn in the general plan. A fragment from the film "When the worlds collide".

Sometimes the models were made on a large scale. For example, for the disaster film "Metro" (Russia, 2012), models of trains were made on a scale of 1: 3.

Models of trains for the disaster film "Metro", Russia, 2012

For the filming of destroyed cities, models of buildings were made at a scale of 1:10, 1:20, and for a model background with an artificial perspective, a scale of 1/50 or even 1/100 of nature.

Working moment of shooting a model of the city. Film "The Battle of Stalingrad", USSR, 1949

For dynamic, moving layouts, the most common and convenient from a production point of view was the scale of 1: 6 and 1: 8.

So, for James Cameron's film "True Lies" with Arnold Schwarzenegger in the title role (USA, 1994), models of the bridge and cars on a scale of 1: 6 were made for the scene of the destruction of the bridge.

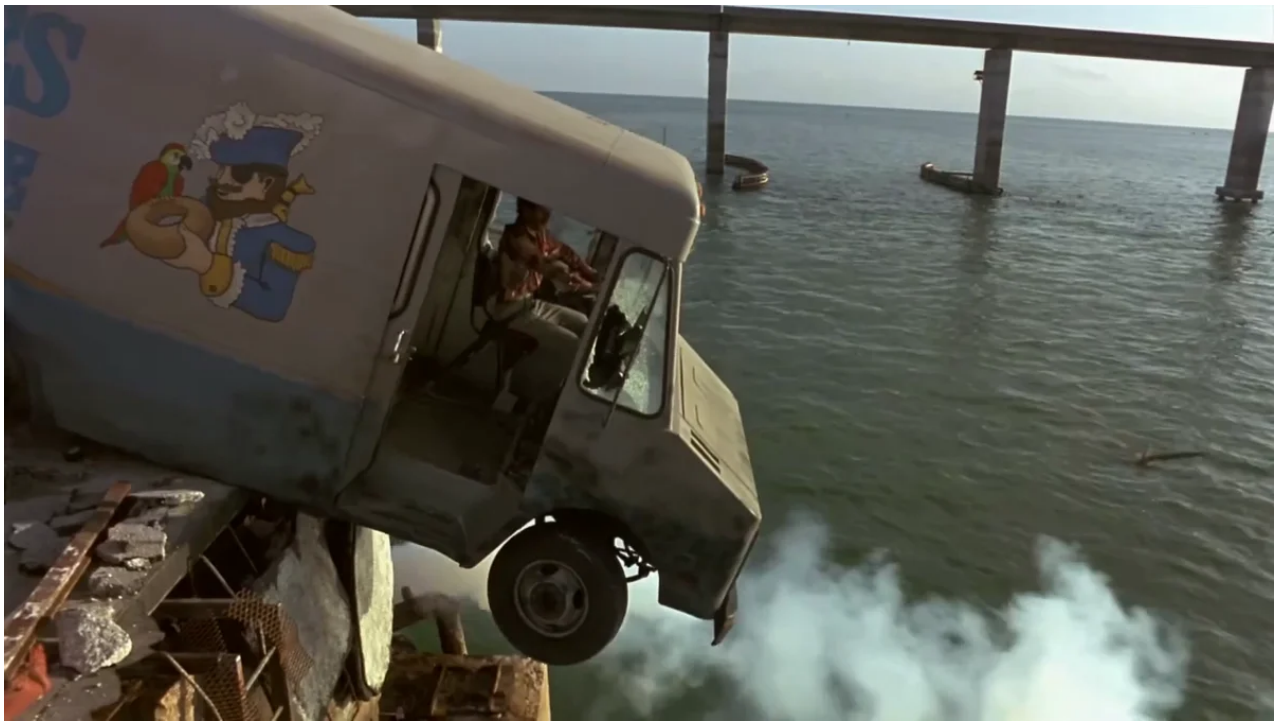
Still from the film "True Lies", USA, 1994. Bridge and car - models.

The flights of missiles were completed on the computer, and the destruction of the bridge by explosions (7 plans) was filmed on the model.

The scene was filmed in shallow water, and the total length of the fake bridge made was 20 meters.

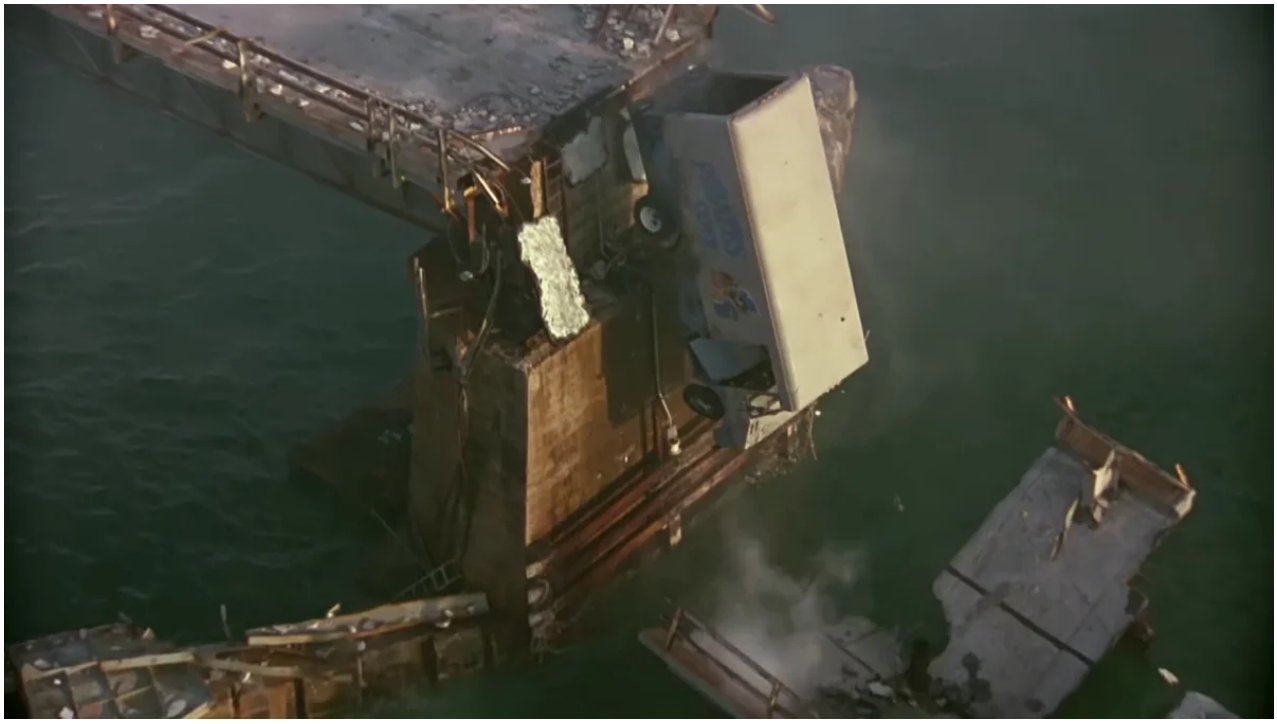
The team of pyrotechnics and modellers of the film "True Lies" against the backdrop of the scenery they have created.

In this scene on the bridge, there is such a moment: the van with the terrorists freezes at the very edge of the destroyed bridge.



A real van with an actor inside.

It balances for a while on the edge of the cliff, and then falls vertically downward and, hitting the bottom of the concrete slabs, explodes.



A mock-up of a van falls from the bridge.

At the beginning of this scene, a real van was filmed, but in the editing, at the moment of the beginning of the fall, it was replaced by a model.

I remembered this moment in the scene because another very characteristic technique was used here so that you would not guess that this is a layout. The technique is that the operator shakes the camera up and down while shooting. This creates a certain dynamics of the frame, especially at the last moment, when the model explodes below: the camera swayed as if from a blast wave. But the camera began to swing even before the explosion. The image wobbles, and you do not have time to focus on the fact that there is a props in the frame.

Fragment with the fall of the van.

I remembered this camera swinging technique when I was reviewing the "famous" rover passage from the Apollo 16 mission. If you look at the entire passage of the rover, and these are two circles - with distance from the cameraman and return - you will notice that at the beginning of the plot the rover is stationary and only after 5 seconds it starts to move. So that you do not have time to realize that a completely motionless doll is sitting on the rover, the operator begins to swing the camera up and down, as if simulating handheld shooting. The

operator makes the pitching from his hands too exaggerated, which once again proves that we are not looking at documentary footage of the rover's passage on the moon, but combined shots taken in the pavilion.

Deliberate shaking of the camera at the beginning of the video.

After reading this, you went to Yu-Tub, found a plot with a rover to check my words and ... did not find any up-and-down camera rocking.

The fact is that the version of the rover passage, in good quality (scanning in high resolution), which is the most famous now, has undergone the image stabilization process using the Deshaker procedure (video stabilized using Deshaker v2.5 filter for VirtualDub 1.9.9) ... Therefore, the rover itself in the frame no longer dangles up and down and from side to side, but now the frame boundaries vibrate feverishly in different directions all the time, and this makes a very strange impression. Here is a video released in 2010.

Everything that NASA did so diligently to hide from the viewer the presence of the mock-up in the frame - the chaotic rocking of the camera - was destroyed by the stabilization program. Initially (in the original video), the image of the rover in the frame swung strongly in different directions. In theory, there should be no shaking, because the shooting was not done with hands - the camera was rigidly attached to the bracket to the spacesuit. This entire structure has a large mass and has great inertia. This inertia is further enhanced under conditions of weak lunar gravity. The shaking was done on purpose to hide the fact that there is a doll in front of the camera on the toy rover. Moreover, from the damped vibrations of the shaking, it becomes clear that during the shooting, the camera was not only tilted up and down, but also specifically hit the tripod leg. In movies, these strikes on a tripod are usually done with the edge of the palm. They tried to do a particularly strong shaking at the moment when the rover had not yet moved from its place - so that the viewer did not have time to pay attention to the immobility of the doll. Shaking was also added when the doll moved to face the camera.

I even had to make a small video on this topic. Here is the video .

If desired, you can find an original copy of the rover's passage on Yu-Tuba, without additional modern intervention. The quality, of course, is a little worse, but we see the video in the form that NASA intended. This is how they looked in the originaltwo minutes drive without image stabilization. Pay attention to deliberately strong camera shake when the rover has not started yet.

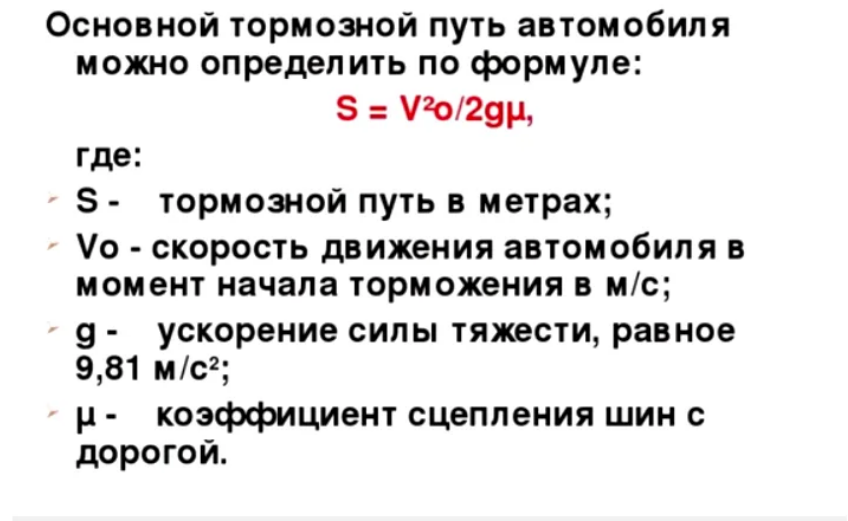
The video is titled “Grand Prix,” as if the astronauts put on a rover race to entertain viewers and demonstrate top speed.

The Americans stated that the power of the engines of these lunar jeeps was 190 watts per wheel. Only 760 watts. It's like an average coffee machine. According to statistics, the average power of coffee machines varies from 500 to 1200 watts.

So I'm not really sure that jeeps with such engines can run like that on sticky sand. They may object to me that there was a reducer in the design, the documentation says something about 1:80. But why look at the documentation if the rover in the shot has nothing to do with the large model? The frame is just a toy. And we see that this toy picks up speed almost instantly, like any light radio-controlled model. But it should weigh more than 215 kg without a person. Add another 160 kg (the weight of the astronaut in the spacesuit) and we get almost 400 kg. The weight on the moon decreases, but the mass remains. And this mass is not so easy to move from its place with low-power motors.

Intuitively, I felt that the rover was not moving properly and braking incorrectly. Not at all moonlit. An engineer-inventor, who writes under the nickname ING250, helped to confirm my feelings, he explained from the point of view of physics what the braking of a rover on the moon should look like.

From the formula for calculating the braking distance of a car, it follows that this distance depends on the initial speed and the coefficient of friction. And does not depend on the force of gravity. It's just that with weak gravity, the adhesion force decreases accordingly. In physical essence, the coefficient of adhesion is the coefficient of friction of a pair: the tread of a car tire - the surface of the roadway.



Braking distance formula

It follows from the formula that lunar driving conditions can be easily simulated on Earth. It is not necessary to create 6 times reduced gravity, it is enough to reduce the friction coefficient by 6 times (the denominator of the formula is the product of the acceleration of gravity and the coefficient of adhesion). This means that we can create the effect of motion on the moon, if instead of dry asphalt under the car there is smooth and slippery ice.

Условия скольжения	μ
Лыжи по снегу	0,045-0,055
Сталь по льду (коньки)	0,015
Шина по сухому асфальту	0,50-0,70
Шина по мокрому асфальту	0,35-0,45
Шина по сухой грунтовой дороге	0,40-0,50
Шина по мокровой грунтовой дороге	0,30-0,40
Шина по гладкому льду	0,15-0,20

Sliding friction coefficients for different cases

Imagine now that a rover weighing about 400 kg is moving on smooth ice. It will be very difficult for the Rover to move and brake. When cornering, it will be skidded and even deployed. At an average speed of 10 km / h, a car with rubber tires on the asphalt brakes and stops after half a meter (a little more). The braking distance on the Moon will be more than 3 meters.

What do we see in the video? At the end of the drive, the rover brakes sharply with a nod from the front, so that the sand from the wheels is poured forward. This cannot be on the moon. Since the rover has no brakes (engine braking), stopping the rover should be similar to a person on skis stopping in the snow, coasting.

ING250 spoke in more detail about this in your video on U-Tube.

There are, of course, skeptics who do not want to believe their eyes and, looking at the doll, continue to claim that all this was filmed on the moon. The main argument on their part is the fact that no fine suspension is visible in the frames of the passage. If the filming were made on Earth (they reason), fine dust would remain in the air longer than ordinary particles of sand. So, I can reveal one secret. I do not think that by doing so I will reveal a military secret, but maybe for some it will be a revelation. In Moscow, at the Bauman Institute, at the department of self-propelled machines, where lugs for the Soviet lunar rover were developed, the "lunar" conditions of movement on the sand were worked out. So that there was no suspension of fine dust in the air and the simulator of the lunar regolith (and this was ordinary sand), it also stuck together, like on the Moon, this sand was moistened with oil.

So, in our opinion, the most famous rover passes on the Moon from the Apollo 16 mission are just combined footage shot in the pavilion using a doll and a radio-controlled model. The model was about 8 times smaller than the real prototype. To prevent viewers from guessing that there was a stationary doll on the rover, the camera was intentionally shaken by the cameraman in different directions, as if imitating handheld shooting.

*

Cameraman L. Konovalov was with you.

Cameraman L. Konovalov near the models.

Until next time!